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ART. I.—*On Operations for Cleft Palate.* By J. MASON WARREN, M. D.

THE operation of staphyloraphy is of comparatively modern invention. It was first attempted in Europe by Graefe (1817), and was first performed with success by Roux (1819), who seems not to have known of the unsuccessful attempt of the German professor. Shortly after, it was again performed by Dr. John C. Warren, of Boston, who not being aware of what had been done in Europe, himself invented new instruments for it. The operation was at first deemed applicable only to fissures of the soft palate, which, of course, are almost the exceptional cases, as out of from 80 to 100 operations for fissure of the palate which have fallen under my own observation, in not more than a tenth, probably, of the whole number was the fissure limited to the soft parts. Nearly all cases of fissure extending into the hard palate were rejected as unfit for operation, although Roux had suggested the idea of relaxing the soft palate by cutting it completely away from its attachments at the posterior edge of the palate bones. This operation is very likely to prove abortive, from the division of the vessels which supply the flaps with nourishment; and even if it succeeds, it leaves an unnecessarily large aperture in the bones, still to be covered by artificial means. Being impressed by the very great proportion of the cases of cleft palate which were deemed incurable, I was led to perform an operation for the especial relief of the more extensive fissures, which include both the soft and hard palate. An account of this operation (Uraniscoplasty) and its results was published in the *New England Quarterly Journal of Medicine and Surgery* for April, 1843, and also in this Journal for the same year. This operation consisted in dissecting, or rather peeling up the soft parts from the roof of the mouth, as far back in bad cases as the alveolar processes, and then cutting away

by the same section the muscular attachments of the soft palate to the palate bones, thus making a continuous flap of the tissues, from the alveolar arch in front to the extremity of the uvula behind. In addition to this, being very much impressed by the violent character of the muscular contractions, which always caused so much trouble in the performance of the operation in the soft palate, and has given rise to the exercise of so much ingenuity in the invention of instruments for bringing together the edges of the fissure and securing the knots, I was led to the idea of cutting away the organs which are active in producing these effects. In this stage of the operation, which is also described in my paper of 1843, I first divide, with a pair of powerful curved scissors, the posterior pillar of the palate, which is made up chiefly of the palato-pharyngeus muscle. In case this does not effect a sufficient relaxation of the soft palate, by putting this organ on the stretch, the remaining muscles, which still confine by their action the sides of the fissure, will be felt in bold relief at the back part of the palate. This resisting mass is then divided by two or three cuts with the scissors, and immediately the half of the palate, which before the division was almost buried in the side of the throat, becomes flaccid and powerless. This section may be practised with advantage as well in cases where the fissure is simple as where it is complicated with fissure of the bones. In the latter case, if the fissure is very wide, it is often not advisable to attempt the dissection of the membrane from the whole hard palate, but it may be partially separated from its attachments to the bones at the back part of the fissure without disturbing it in front. By operating in this way, the edges of the soft palate can be easily approximated, and a plastic operation performed, "*par glissement*," which will in a measure also close the cleft in the bones. This, in fact, is the operation which I have chiefly practised of late years, from having found with what ease and efficiency an artificial plate can be adapted to cover the remaining small fissure of the bones, thus saving a very tedious and difficult part of the operation.

Some time after my first publication, Mr. Fergusson, the distinguished professor of surgery at King's College, London, published a paper upon Staphyloraphy in which he states that in addition to the division of the posterior pillar of the palate by means of the curved scissors, he also divides the levator palati muscle above the velum, using for the purpose a sharp-pointed curved knife passed through the fissure. This manœuvre confessedly involves some danger, in unskilful hands at least, of wounding the internal carotid artery,¹ and it complicates the operation by the unnecessary addition of a new instrument without effecting the division of the resisting muscles with any more thoroughness than had previously and has since been done in my operation with the scissors only.

Professor Langenbeck, of Berlin, has recently published a paper in

¹ See Fergusson's Practical Surgery, 3d edition, p. 612.

which he claims the invention of a new and important modification of the operation for fissure of the hard palate, from having insisted that the periosteum, as well as the mucous membrane, should be peeled off from the roof of the mouth. In my original paper I stated that "the mucous membrane of the hard palate is to be carefully separated from the bones with a long double-edged bistoury, curved on its flat side, and is rather peeled than dissected off, from the difficulty of making any sawing motion with the knife in this confined situation; the obstacles always being greater in proportion to the obliquity of the palatine vault." It will be seen from this description, that the only safety against the perforation of the flaps lies in keeping the knife close to the bone during the whole dissection, thus insuring the preservation, in connection with the flaps, of the greater part of the periosteum. Any one who will take the trouble to make a dissection of the hard palate may easily satisfy himself both that it is extremely difficult even in the dead subject, and still more so on the living, to split the soft tissues which cover it, and that it is also impossible to separate the whole periosteum cleanly from the rough and jagged protuberances which mark the oral surface of the palatine plate of the upper jaw.¹ It is therefore evident that the learned German professor has but accomplished the same results which I reported twenty years ago, and which have since been attained by many other surgeons, both in this country and in England.

The result of those operations may be stated briefly as follows. With the exception of perhaps half a dozen cases I have never failed to get more or less union of the soft palate. Sometimes one, or more rarely two, of the sutures have given way at the upper part where the tissues are put most fully on the stretch. If any of the stitches hold, however, and the smallest union takes place, it may be extended to any requisite degree by the application, at considerable intervals, of the solid nitrate of silver to the angle of the remaining fissure. The great point is to establish the arch of the soft palate, and after this is effected, artificial means can be used to cover up the remainder of the opening. Of course the more completely the fissure is closed by the operation, the better it is, but what I mean to say is that in the most extreme cases of very wide fissure, an operation can be performed which is as effectual in restoring the voice as in cases of fissure of the simplest character confined to the soft palate only. It is a curious fact that in one or two cases which I have seen of fissure extending but little further than through the uvula, the power of modulating the voice was as much impaired as in other cases where the fissure extended quite into the bones.

¹ See also papers upon this subject in the *Medical Times and Gazette* for January 18th, and February 8th, 1862. Also for structure of the coverings of the hard palate, see *Kölliker Gewebelehre des Menschen*, 3te Auflage, § 132, or the Sydenham Society's Translation, § 129.

The question is often asked of the surgeon whether the voice will be immediately restored by the operation, and if not, in what time the full restoration may be expected. The answer must, of course, be very indefinite; for in fact the patient has now to learn for the first time the art of using the palate in articulation. Almost every patient, after the opening is entirely closed, experiences a sense of relief, which is owing both to the greater ease with which deglutition is performed, and also to the protection afforded by the new palate to the mucous membrane of the posterior fauces, which, before the operation, was dry and parched from the constant passage of the air over it. Within the last few months I have had occasion to see several patients upon whom the operation was performed two or three years since. Two of them are teachers in public institutions, and the only defect to be perceived is a slight huskiness of the voice, which would hardly be noticed by any one ignorant of their former condition. I do not remember to have seen a case in which the patient was not benefited.

The hemorrhage which attends this operation is much less than might be expected from the very free incisions. These would at first sight seem likely to give rise to excessive bleeding, but I have never, even in the most vascular subjects, experienced any trouble: rinsing out the throat thoroughly with iced water is generally all that is needed. The same may be said in regard to the procedure necessary for the dissection of the mucous membrane from the hard palate. The time at which a vessel is apt to throw out a jet of blood is in cutting away the attachment of the reflected tendon of the tensor palati muscle where it joins the posterior margin of the palate bones, at which point some branches of one of the palatine arteries are generally divided. The bleeding, however, soon stops under the use of iced water, but, in one instance, where it continued after the sutures were adjusted, the upper stitch being very tense, and lifting the membrane up from the bone so as probably to prevent the retraction of the vessel, I was obliged to cut the stitch away, so as to allow the membrane to fall back upon the bone, when the bleeding at once ceased. In a case which I witnessed in the practice of another surgeon, the hemorrhage was quite abundant, and a solution of perchloride of iron was freely used both at the time of the operation and again when the bleeding returned some hours after. This application materially interfered with the union, although the case ultimately did well. I have never found it necessary, as has been recommended by some surgeons, to delay the adjustment of the sutures for any great length of time, in order to allow the bleeding to cease. A bit of ice held in the mouth after the edges are brought together has always been sufficient, with the single exception of the case here mentioned, in which it was necessary to cut away the upper stitch.

In the first few cases on which I operated, the patient was nourished by enemata for a few days immediately succeeding the operation. It was soon found, however, that abstinence from the use of liquids by the mouth was

followed by dryness and irritation of the fauces, which came near defeating the objects of the operation, and I was surprised to see how little danger there really is in permitting the patient the free use of liquid nourishment. In fact, the paralyzed condition of the muscles of the palate after their division prevents all danger of separation through their agency. After the first three or four days, an irritating cough is often brought on by the secretion of tough adhesive mucus in and around the wound. This cough is often so persistent as to threaten the destruction of the newly formed adhesions; it can sometimes be alleviated by the use of warm or acid drinks, or by brushing the surface of the wound gently with a weak solution of nitrate of silver.

At first I was disposed to begin to remove the sutures at the earliest possible period, but latterly, from having once had all the adhesions give way during the act of withdrawing them, I have allowed them to remain a very long time. It is rather important that the mouth should not be too widely opened during the early stages of the adhesive process; once, on the fifth or sixth day, I have known the entire wound to give way from the patient opening the mouth widely for the purpose of inspection.

I have tried one case of perfectly simple fissure in a child during the past year, without dividing the muscles. Everything looked fair after the operation, and it was the easiest and most promising case I have had for some years; the edges of the fissure came so easily together that I thought it unnecessary to add to the wound by the division of the muscles. The adhesions gave way about the seventh day, whether from the cause above stated, or from the child having taken solid food, or having committed some other imprudence, I am unable to say.

As to the proper age at which to operate—in one case of a fissure which extended but little more than through the uvula, I operated on a child of between six and seven years; but generally it is necessary to wait until the patient is old enough fully to appreciate the importance of the operation, and to submit patiently to pain and inconvenience, for this is one of the very few operations in which the use of anæsthetics is inadmissible. Under very peculiar circumstances, I suppose, ether might be administered, but not without some risk to the patient, and much embarrassment to the surgeon, from the constant flow of blood down the throat.

Of instruments especially designed for this operation, the forceps and "porte fil" are the most essential. The forceps, of which two pairs are required, are made with a double curve, adapted one to each side of the palate. They should have two teeth to each blade; the hinder blade, when the forceps are opened, being made to pass behind the palate, the construction of the instrument being such as to admit of the seizing of the extreme edge of the palate without taking a deeper hold upon its lower than on its upper surface. This, it will be seen, cannot be done by the common straight hooked forceps. The grasp should be sufficiently firm to control the palate

while the muscles are being divided, to which a very strong resistance is made. The strip of membrane upon the margin of the fissure can be removed without detaching the forceps from their first hold. The same process is repeated on the other side with the other pair of forceps. When this is finished, and the bleeding stopped by the use of a little iced water, the sutures are introduced. I have generally inserted the middle suture first, by that means controlling the palate, and thus rendering the insertion of the others easier. The lower one should be introduced last. The sutures used are single threads of surgeon's twist prepared by soaking, a day or two beforehand, according to a suggestion of my friend and former pupil Dr. Calvin G. Page, in the compound tincture of benzoin. By this means the silk acquires an adhesive property, which prevents its slipping when it is tied. In case the threads are not so prepared, they should be drawn partly through, wiped as dry as possible, and waxed at the point where the knot is to be tied. The thread should then be drawn suddenly back into the wound, brought together with a surgeon's knot, and this rapidly secured by a second one. In introducing the sutures I have found the needle of Schwerdt the most convenient instrument; the ligature is carried through the palate from behind forwards, the eye of the instrument is opened, the thread disengaged by means of a hook, and the needle withdrawn. At the lower part of the palate, where the parts are very movable, it is difficult to fix them with this instrument, and a simple curved needle held in a "porte aiguille" answers better. The chief objection to Schwerdt's "porte fil" is the difficulty of keeping it sharp, as the point being split, it is necessary to make it somewhat blunt to give it the requisite strength.

I have already stated that a heavy pair of French scissors curved on the flat side, is the instrument which I use for dividing the muscles. They should be made with great care, and the blades adjusted so as to cut perfectly true. For dissecting the soft parts from the hard palate, I use a spear-pointed knife with a short and broad blade curved on the flat side, the cutting part being about half an inch in length, the shank three inches long, the handle, large and roughened, four inches long. The membrane is partly cut and partly peeled off from the bones. It would at first seem probable that in this dissection of the tissues covering the hard palate, there would be danger of cutting off the palatine artery either where it emerges from the posterior palatine foramen or in its course along the roof of the mouth. I have not, however, met with this accident, and am inclined to believe that it is owing to the fact that the vessel is here protected by the groove sunk for it in the bone.

If the whole of the uvula is left, it is frequently brought in contact with the tongue in such a way as to produce cough and irritation of the throat; it also often becomes œdematous, and unites imperfectly. It is better, there-

fore, as a general rule, to remove the greater portion of it by the preliminary incisions.

I have to-day accidentally seen three cases of extreme fissure of both soft and hard palate. One, a woman of about thirty years of age, upon whom I operated about a year ago for a very wide fissure. Union of the soft palate was obtained to the extent of about an inch; the tension having been very great from the unusual deficiency of the soft parts. From a fear that her teeth were not sufficiently strong to afford a support to the plate, or from some other insufficient reason, she had deferred having an artificial plate introduced until the present time, and in fact was desirous that I should make the attempt to close the fissure in the bones, which was very wide, and had unusually shelving margins. This I told her I would attempt in case the aperture could not be covered in a satisfactory manner by artificial means. Dr. Rufus E. Dixon, who has made a great many such plates for patients upon whom I have operated, took a cast of the mouth and in about three days produced and fitted a plate to it. The effect was an immediate improvement in the speech, which became perfectly intelligible. In this case there are three facts deserving of notice. In the first place, the fissure extended through the lip, on the right side of the mouth, which is unusual, the arrest of development being almost always on the left side. The vomer was in this case continuous with the right palatine process of the maxillary bone. 2d. Before the operation, from some peculiar idea of her physician, the patient had starved herself for two or three weeks by way of preparation, probably with the idea of getting the stomach accustomed to the use of as little food as possible. 3d. From this reason, before the first incisions were completed, she became so faint as to make it difficult to proceed, and to render it necessary to administer stimulants; an ounce of brandy, or perhaps a little more, being given. The effect was, on an empty stomach unaccustomed to the use of spirits, that the operation was hardly resumed before she went into an apathetic state, from which it was almost impossible to arouse her, and it was only by the application of ammonia to the nostrils, cold to the head, and much energetic remonstrance, that she could be brought to a condition to admit of the completion of the operation. Soon after seeing this patient, a lady upon whom I had operated for a similar fissure two weeks since, came to me; the operation, so far as I had attempted it, having fully succeeded, and although the palate still remains somewhat red and tender, she is to go to-morrow to have a cast made, and will probably be able to wear the artificial plate in the course of the week. Shortly after this lady had left my house, a young man, twenty years of age, called on me, having been directed to do so by Dr. S. D. Townsend, who had very skilfully operated on his lip, many years ago, for a fissure attended with great separation of the bones. A very extensive dissection of the alæ of the nose and of the lip had been necessary to cover over the opening, and the

symmetry of the nose had been completely restored by the operation. The cleft in the alveolar arch was still very great, and there was also a wide fissure through the hard and soft palate. To remedy this deficiency, about a year since a very skilful dentist had made for him a gutta-percha palate, with two artificial teeth affixed to it, for the purpose of closing the gap in the alveolar arch. This covering extended quite back to the point in the fauces generally reached by the uvula; notwithstanding this his voice was wholly unintelligible, and he could not make me understand his name, until he wrote it. I mention this to show how essential the simple restoration of the arch of the palate is in articulation. In the present case I agreed to operate for this purpose in a few days.

A fourth case has also come under my notice within two days, as extreme as that last mentioned, and upon which I propose to operate shortly. The fissure extends through both the soft and hard palate, and the alveolar processes, and there is a wide hare-lip. This boy is 19 years old, and applied to me to have his lip operated on. As the large opening into the mouth afforded an uncommonly favourable opportunity for operating on the palate, I advised him strongly to have the latter operated on first, the idea of which had not before occurred to him.

Before terminating this paper, I would, in connection with it, make a few remarks on the operation for hare-lip, partly on account of its bearing on the operation for cleft palate, of which it is a very frequent complication. Dr. John Warren was an advocate of very early operation for this defect, and Dr. J. L. Peirson, of Salem, wrote a paper in which he urged the same thing strongly upon the profession. I have often done it at a very early age, and the result of my own experience is either to operate during the first twenty-four or forty-eight hours after birth, so that the child may be put to nurse as soon as the mother's milk is secreted, or else to defer the operation for a couple of weeks, until after the so-called icteric condition has passed, which frequently follows on the first few days after the birth of the child. In one instance in which I operated on a child, where the colour of the skin was so slight as not to attract my attention until after the operation, I at once perceived, on making the incisions, that the hemorrhage was greater than usual, proceeding, as it did, from the whole cut surface of the lip. The sutures were, however, introduced, and tied with great care, but in spite of styptic applications, the hemorrhage continued to such a degree as to endanger life, and it was found necessary at last to cut away the sutures, and to tie up piecemeal the whole margin of the fissure, leaving the opening much larger than before the operation. The wound did well, healing after the ligatures had come away. In this condition I left it, without any raw surface remaining, with the understanding that another operation could be performed at some future time. I did not see it again for five months, when, to my surprise, the child was shown to me without any appearance of a hare-lip. The parents said that contraction and coaptation of the

edges had commenced at the upper margin of the fissure, and had gradually extended until the entire opening had become obliterated. No scar appeared as after the usual operation, and the only indication that there had ever been a hare-lip was the slight looping up of the prolabium. When I first commenced practice, I adopted the French method of using sutures instead of pins, which had then been exclusively used in Boston, giving up bandages and sticking plaster as liable to cause irritation and to confine foul secretions, and I either made no application to the wound, or used merely a bit of linen or lint wet with water. I also introduced one stitch on the inner edge of the lip, cutting the ends of it very short. Finding that disordered digestion was of very frequent occurrence from giving up the natural method of nourishment by the breast and feeding the child with a spoon, even where the mother's milk itself was given, diarrhœa being brought on, and the process of repair interrupted and often destroyed by it, I was led to make the experiment of allowing the child to take the breast during the period of the cure, and I have had no cause to regret the trial. To my surprise I found that in the sucking process the edges of the fissure, instead of being drawn apart, as would naturally be expected, are, on the contrary, forced together in a way most favourable to their perfect coaptation.

Boston, May, 1863.

ART. II.—*Delayed Union of Fractures, with Cases and Illustrations; the Successful Employment of Malgaigne's Spike in connection with Drilling in a case which had previously resisted drilling employed by itself.* By DAVID PRINCE, M. D., of Jacksonville, Illinois. Read before the Annual Meeting of the Illinois State Medical Society, held in Jacksonville, May, 1863. (With six wood-cuts.)

WHILE fractures sometimes unite under the most adverse circumstances, at other times union is delayed or does not take place where the appearances are at first most favourable. This difference of results, independent of external circumstances, can only be accounted for by the assumption of constitutional differences of aptitude to bony formation. While ossification will sometimes extend through an inch or two of plasma, reaching from one fragment to another, the separation to the extent of one-fourth of an inch will at other times prevent the bony union of the fragments. While privation and starvation sometimes fail to retard union, there is in some constitutions a necessity for a liberal diet to afford the necessary stimulus to bony deposit. The antiphlogistic remedies for high inflammation, if continued unnecessarily long, may sometimes prevent union, while in other